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OHIO FARM WOODS

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The Ohio State University

Ohio Farm Woods

OHIO is a farm woods state, with nearly 70 percent of the area—2,410,000 acres—in woods. Of 200,000 Ohio farms, 130,450 have woods. The 1500 sawmills in these areas produce nearly 90 percent of the total lumber production of the state.

Farm woods in Ohio produce an annual income of more than 6 million dollars in the form of sawlogs, lumber, pulpwood, posts, and fuel wood used and sold on farms. In addition, maple syrup products, produced principally in northeastern Ohio, amount to 150,000 gallons of syrup with a gross value of $700,000. This is nearly 3 dollars an acre for farm woodlands in the state.

Even so, this is far below the annual income woods are capable of producing. By protection and improvement, these woodland areas could be made to yield double or even triple the present income.

Protect Woods from Livestock

The first thing to do in managing a farm woods is to exclude all livestock. Protection from grazing is just as essential in growing a forest crop as it is in growing cultivated farm crops.

Nearly three-fourths of the woods of the state furnish low grade forage for livestock. In some of the typical cornbelt sections of western Ohio, 90 percent of the woods are used for pasture. Most farm owners would object seriously to turning cattle into a fine stand of corn, but many apparently see no harm in turning them into a fine stand of young, growing trees.

Before they can practice good forestry intelligently in farm woods, many farmers need to become aware of good forestry practices.

Unless livestock is removed from the woods, little can be said or done in outlining a future program for farm forestry in the state.

Fig. 1. Value of timber products sold and used from Ohio farm woods is at least 6 million dollars annually.

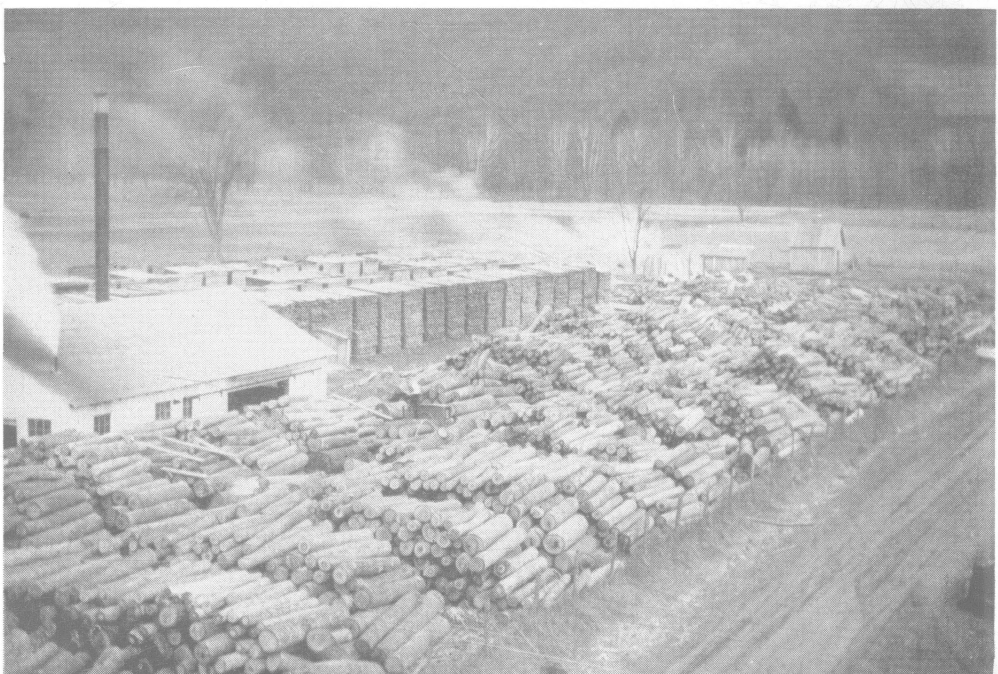


Fig. 2. Ohio is in the central hardwood region. *Northeastern Area*—Beech and sugar maple, associated with white ash, basswood, oak, chestnut, and tulip poplar. *Eastern Area*—White oak, red oak, and chestnut, associated with beech, maple, hickory, black walnut and tulip poplar. *Southeastern Area*—Mixed oak, chestnut, and poplar, associated with hickory, pine, and black walnut. *Southwestern Area*—Elm, ash and maple, associated with oak, hickory, beech, cottonwood, basswood, and sycamore. The map shows original forest types.

Pasturing Reduces the Value of Woods.—Grazing prevents normal development of woodlands by:

1. **Destroying seedlings (future crop crop trees).**
2. **Disturbing the formation of leaf litter.**
3. **Creating openings in the forest, in which grass (forest weeds) becomes established.**
4. **Packing the soil and injuring the tree roots.**
5. **Decreasing the moisture holding content of the soil.**
6. **Reducing the vigor and vitality of the trees, thus allowing diseases and insects to attack them in their weakened condition.**
7. **Lowering the grade and quality of sawlogs.**
8. **Decreasing the amount of wood growth, thus reducing the yield in saw timber and the net income each year.**

All these factors contribute to the destruction of the farm woodland. The tender seedlings are eaten by cattle during the summer months, thus checking natural reproduction. Constant tramping packs the forest soil, and destroys the natural mold or mulch necessary to conserve available water.

Open pasture woods encourage grass growth, and such woods soon contain numerous dead-topped or stag-headed trees. In a protected woods, the crowns of the trees are vigorous, green, and healthy in appearance, while in the open, grazed, farm woods, particularly in western Ohio, the tree-like skyline is usually characterized by dying tops. Such areas are not productive woodlands. They are simply remnants of what was once the virgin forest, and now are merely shaded pasture or hog lots.

Undergrowth in Woods Desirable.—Many farm owners object to a "brushy" growth in woods. The natural reproduction, or undergrowth from seedling to sapling size, is necessary to renew the forest growth, and to maintain a protective covering to the forest floor. It also acts as a buffer to shield older trees from winds. Openings created in the forest by destroying the natural reproduction allow winds to blow through the interior of the woods, sweeping the leaves out into the open fields and drying out the forest soil. In a dense forest the leaves are held in place, thus enriching the soil and conserving moisture.

Unfortunately, in grazing or browsing by livestock, the most valuable timber producing species are eaten first. White ash, red oak, sugar maple, tulip poplar,

Fig. 3. Profitable farm woods have protection from grazing to insure thrifty seedlings, vigorous tree growth, and high quality sawlogs. This picture was made after 22 years of protection from grazing. Tulip poplar, white ash, sugar maple, and red oak are the crop trees.

and basswood are preferred by cattle to the so-called "weed" varieties like blue beech, ironwood, dogwood, hawthorn, and sassafras. Also, the tender and more palatable varieties with succulent shoots and branches are devoured before the tough and wiry wood grasses are even touched. Consequently, the pastured woods is largely taken over by weed trees and competing grasses in the open, shady areas. If the older trees are able to survive, they usually deteriorate into cull or worthless trees.

Wood Growth More Valuable than Pasture.—Many farmers insist that they must pasture their woods to derive an income from it. The value of the pasture, they believe, more than pays for the dollar-and-cent value of timber growth destroyed. Data show, however, that this is not the case. The value of wood pasture under average conditions is not worth more than 35 cents an acre, while a protected woods receiving ordinary care and management will yield $4 to $5 an acre a year in sawlogs, posts, and fuel wood.

Save a Part of the Woods.—Even under the most intensive farming practices it should not be necessary to use the entire farm woods for pasture. Shade and shelter for the livestock can be secured by fencing off a portion of the woods for

Fig. 4. These woodlands were similar in 1932. However, the woods on the left hand protection while those on the right had heavy pasturing. The so-called "brush" on the left contains seedlings of sugar maple, tulip poplar, and white ash. Big trees are made from little ones, so it would be difficult to establish a new crop of trees at right for minimum cost.

this purpose, leaving the remaining area protected for timber growing. By this method the woods would produce timber for the farm continuously and still there would be available shade and a "run" for the livestock under the shelter of trees.

Underbrush a Bird Refuge.—Protected woods are a constant source of wood products for the farm, and also give protection for birds and wild game. Indirectly, they benefit the farm more than is ordinarily appreciated. Birds, in controlling insect damage to the farm crops, save the farmers of the state many thousands of dollars each year.

Improving Woods by Thinning and Selection Cuttings

The average farm woods in Ohio is producing only one-third to one-half of what it is capable of producing in volume of growing timber. Probably the average woods produces less than 150 board feet of saw timber an acre a year, while by thinning, by cutting out the less profitable timber, and eliminating weed and cull trees, it could be made to produce from 300 to 400 board feet an acre each year. The intelligent use of the ax or saw in the woods is important in building it up to a high standard of production.

The ideal farm woods is managed on a selection cutting basis. In it trees of all ages and sizes are growing. The owner can find trees for lumber and fuel any year. In this way the woods will produce timber continuously, and there need be no fear of wood famine so far as the farm is concerned.

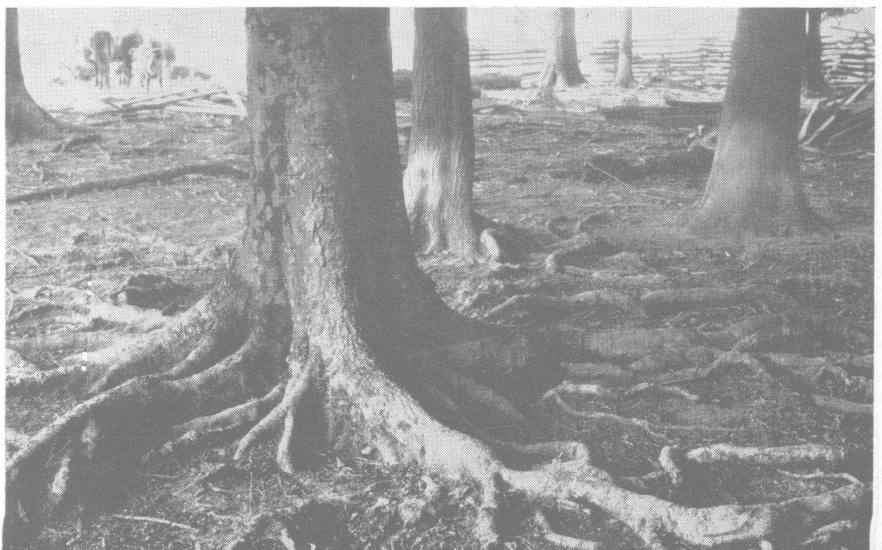
The average farm woods will respond to improvement cutting and cultural treatment to produce quality timber and higher yields just as any crop on the farm responds to improved farm practices. However, before a woods can be made to respond to cuttings and thinnings, it must consist largely of tree varieties that have high timber quality. Such trees must then be favored or given preference over low quality trees or weed varieties.

Just as the dairy herd or poultry flock can be improved by proper selection and culling methods, so can the farm woods be improved to produce lumber of high quality and value.

Make an Inventory of Trees in Woods.—As a beginning toward improvement, an inventory should be made as to varieties, size, and merchantable possibilities of the trees comprising the forest. With this as a guide, a simple working plan can be outlined for future handling and treatment of the woods.

The profitable tree list should include the white oak, red oak, white ash, tulip poplar, basswood, black walnut, sugar

Fig. 5. When litter is destroyed and the ground is packed hard around root systems, there is an unhealthy soil condition for woods. Ground cannot absorb water and sheds rain like a tin roof. Also, no seedlings or pole-sized trees can grow.



maple, hickory, and in some sections red and white elm. (See Fig. 2.)

The weed trees that should be removed to improve growing conditions in the forest would include ironwood, water or blue beech, dogwood, choke cherry, sassafras, pawpaw, hawthorn, and service berry. The ironwood, blue beech, and dogwood are prolific seeders and the most persistent of the weed varieties.

Remove "Weed" Trees.—Before removing the livestock from a woods, all old seed trees of the weed type should be cut down, or the future woods would likely develop a dense undergrowth thicket of ironwood and dogwood. This is particularly the case in the oak-hickory type of forest.

Another class of trees that should be removed in an improvement cutting would be the cull trees—those that are windshaken, doty, diseased, or insect infested. They are commonly found in old cutover tracts, and were left because they had no market value when the woods was cut for timber.

Beech is a typical example of a cull tree. Beech trees are slow growers and in the old forest they are usually hollow, and have wide open crowns, robbing and crowding out more valuable species like the ash, tulip poplar, and white oak. Beech are termed "wolf" trees by the forester because of their tendency to over-topping and crowding. No other tree in the average farm woods is more shade enduring or tolerant than the beech. For this reason, less tolerant varieties are unable to compete with it for sunlight, and they soon lose out in the struggle for the survival of the fittest. There are many examples where a single beech tree has crowded and destroyed hundreds of small thrifty saplings of white ash, oak, and tulip poplar. In making a farm woods more profitable this is the type of tree that first should be removed.

Other types of forest trees that should not be favored, owing to their slow growth and low merchantable quality, are the scarlet, pin, and blackjack oaks, black gum, and red maple. It is impossible to classify true weed and valuable varieties for each section of the state, except in a general way. For example, the sugar maple of northeastern Ohio is a valuable tree for that section, but in southeastern Ohio it is counted a poor variety to favor in the farm woods. Another example is that of the white elm, which in northwestern Ohio grows to be a valuable forest tree, while in southern Ohio it is classified as a cull or weed tree. (See Fig. 2.) No definite set of rules can be outlined that will fit each individual farm woods. Usually, the best practice to follow is to cut only those

Fig. 6. An all-aged oak-hickory woods contains large, medium, and small-sized trees of different kinds and ages. Owners protect such woods from fire and keep all livestock fenced out. This woods is in good condition to keep growing and producing wood crops.

trees that are interfering with DESIRABLE TREES.

If the owner of the woods knows trees well, sound judgment and good common sense will go a long way toward helping him decide the best way to handle the forest. It is not necessary to spend time removing "weed trees" if the more valuable species are making satisfactory growth.

Danger in Thinning Too Rapidly.—The woods should not be opened rapidly. Large openings, even though the cuttings are made to benefit or improve the woods, should be avoided. Matured or cull trees should be taken out gradually, and thinnings should be made conservatively. Too many openings made in the woods allow the sun and wind to dry out the soil. Then, too, the unchecked wind may uproot many valuable sawlog trees.

Use a Forest Windbreak.—Trees require many years to grow to sawlog size. Each year, too, ice storms and wind take a heavy toll of farm timber. For this reason, particularly in the open, level sections of the state, a fringe or border of trees of heavy undergrowth should be left on the side of the prevailing winds. Norway spruce, hemlock, or Austrian, white, or red pines also make an excellent shelter belt around an open exposed woods. Such strips or borders also make good cover for birds and wildlife.

Grapevines a Woods Nuisance.—When removing weed trees and improving the stand, grapevines should be cut away from the trees. Serious damage is done to the tops of trees by strangling vines. In many woods, entire areas of young second growth timber have been ruined by matted, dense patches of grapevines. During the winter months, snow, sleet, and ice crush the vine-laden trees to the ground.

Work in Woods in Winter.—Best time to improve the woods is during the winter months. This is an ideal time to harvest the sawlog crop or cut the winter's supply of fuel. Harvesting the timber crop and improving the farm woods can be accomplished in one operation by using an ax and saw. Confine the cutting to one area, rather than spread over the entire woods. Before cutting a large, matured, salable white oak, a few timely strokes with the ax will eliminate surrounding weed trees, which will allow more room to throw the tree and afford greater ease in working around it and in sawing it into logs.

Fig. 7. Here are two fine specimens of original growth yellow poplar (tulip). Clean straight trunks show woods growth and good soil. Such clear logs command high prices and grade lumber.

Proceeding gradually over the entire woods from year to year, the timber crop can be harvested and the woods left in an excellent condition. The same methods can be used in cutting firewood, posts, and poles. In dense, thick, even-aged, second growth areas, suppressed and over-topped trees can be removed in thinnings for fuel, leaving the more vigorous open crown trees to develop and grow. Always bear in mind that fuel wood can be cut from the culls or poor timber trees.

Fig. 8. Winter is an excellent time to work in the woods. Thinnings and improvement cuttings can be made into posts, fuelwood, and pulpwood.

Fig. 9. Measuring the diameter of a red oak with a diameter tape helps determine time of harvest. Total number of board feet can be found with a log rule and the height or number of logs in a tree.

Estimating Standing Timber*

Before timber is sold, an estimate should be made of its value. Indeed, such information should be available whether the trees are to be sold or not, so that at all times the owner will be in a position to sell or bargain with a possible buyer. Unfortunately, the owner or farmer usually does not concern himself with the value of his woods until he has a prospective buyer. In most cases, the buyer examines the timber several times before he approaches the owner who, although he may have owned the woods for years, may not have examined the standing timber or attempted to place a value on it until the day the buyer asks a price.

Ability to estimate timber in the log or on the stump is acquired by practice, and knowing the timber or trees in the woods. Just as a farmer can estimate the number of pounds in a beef steer on the hoof, or the yield of wheat an acre in the shock, so with practice can a farm woods owner estimate the number of board feet in a tree, or the yield an acre in board feet of standing timber.

Measurements Needed in Estimating Lumber.—In estimating the amount of timber in trees, two essential measurements are needed: (1) the diameter, and (2) the height of merchantable length of the trees. By selecting individual trees, the diameter can be measured with a tape or calipers 4½ feet above the ground, or diameter breast high (D.B.H.)

For example, the diameter of a tree 4½ feet above the ground is 30 inches. Cut a 16-foot pole and place against the tree; this will determine the approximate height of the first cut in a 16-foot log. Observe closely the point where the tip end of the pole touches the standing trunk of the tree. This will mark the end cut of the first log in the tree when it is felled and cut into log lengths.

As logs are scaled or measured by using the length and top-end diameter inside the bark, it will be necessary to

* Tree scaling and estimating sticks are now available. They provide the cheapest and most easily used method for helping woodland owners to measure standing timber and logs. Timber and log scales are available from the Extension Forester or County Agricultural Agents' offices.

judge or calculate the diameter at this point. If the tree measures 30 inches, 4½ feet above the ground, a good rule to follow is to deduct 3 inches for bark and 2 inches for taper, which would mean that the end of the first 16-foot cut in the standing tree would be 25 inches in diameter inside the bark. The number and size of logs in the remaining portion of the tree can then be estimated.

By using the Doyle rule (page 14), which is the accepted rule for selling timber in Ohio, the contents of the entire tree can be calculated. By measuring trees of different diameter and height, ability can be acquired to judge or estimate trees with the eye without the aid of measuring devices. Then the amount of timber in the entire woods can be estimated quite accurately.

The Doyle Rule.—Deduct 4 from the diameter (in inches) **of the small end of the log** (not including the bark) **and square the remainder. This gives the contents of a 16-foot log in board feet.** The number of board feet in logs of other lengths is in proportion to their lengths; for example, an 8-foot log contains half as many board feet as a 16-foot log, and so on.

The Doyle log rule was based upon large logs, and was made at a time when small logs were not important to use or saw into timber. When logs came to the mill in abundance 24 inches or more in diameter, the scale was fair and quite accurate, both to the seller and buyer of the logs. During the past 25 years, more and more logs have come from second growth timber less than 24 inches in diameter. The error in the rule lies in the fact that it deducts 4 inches from the measured diameter for slabs. This was fair on large logs 24 inches and over, with heavy bark thickness, but to apply the same rule to small logs, 12, 14, and 16 inches in diameter means that there is little left to square according to the rule. Average logs in the 16-inch diameter class will, when sawed into lumber, overrun the rule by 30 to 50 percent, depending on the size and widths of lumber.

If small logs are to be cut and sold under the Doyle rule, it would be more economical to reserve them until they

Fig. 10. Both long and short diameters must be read and averaged to get the log diameter of this oak log on the log deck—or skids—of a portable mill. Note the center rot which must be scaled out.

have increased their diameter growth several inches.

International Log Rule.—Many rules have been suggested to replace the Doyle rule, but they have made little headway in this region. The International log scale now being used in the eastern states for scaling second growth pine might well be adopted in this region for second growth timber. This rule has been tested for accuracy at the mill, using saws with a ¼-inch kerf, and the overrun and underrun has been very low. All things considered, this seems to be the most scientific and practical rule, both to the farm woods owner and the timber buyer. (See page 15).

Methods Used in Estimating Timber.—There are several methods used in measuring and estimating timber in Ohio. Among these are (1) tree-by-tree count, (2) sample plot method, and (3) strip method.

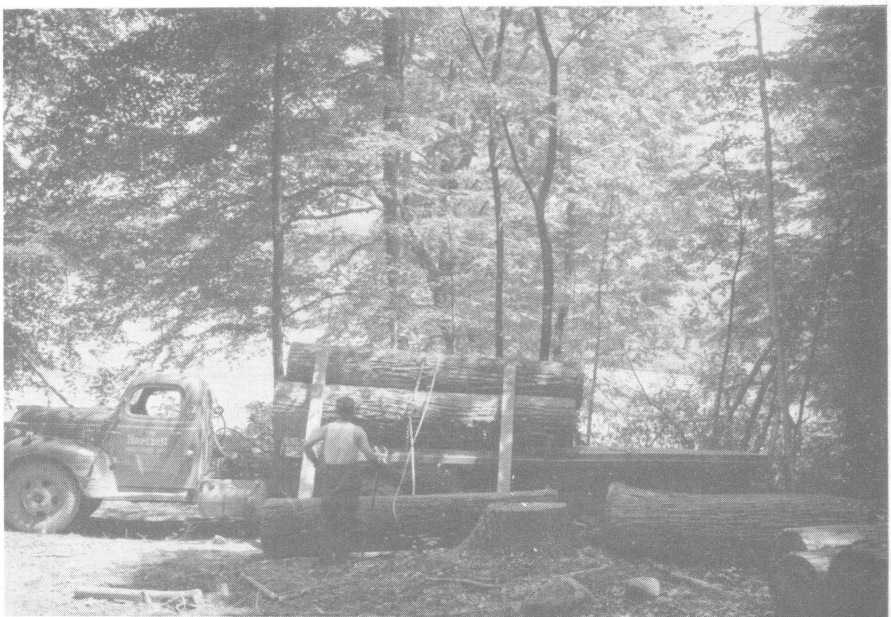
Tree-by-Tree Method.—Timber buyers with experience usually walk through a woods a few times, observe closely the standing timber, and pick out several trees that will scale, say 1,000 or 500 or 200 board feet. They then count the total number of such trees in the woods, repeating this procedure for the various sizes of trees. Barring defects, the total content of the woods can be estimated in a short time. Where tracts are not over 50 acres in extent, the most simple method is to use the tree-by-tree count, estimating each tree individually and then totaling the number of trees merchantable in the tract by species and amount of saw timber in board feet.

Practice and skill in judging heights and diameters with the eye can be acquired by the average farm woods owner, if he is willing to spend a few days in the woods each year measuring the marketable timber.

Sample Plot Method.—On large areas the sample plot method is used in measuring and estimating timber. In this, several small plots of ¼ to ½ acre each are laid off. All the trees are measured on the plots and computed in board feet, and then an average acre is determined as a standard in computing the board feet or stumpage volume of the total acreage of woods.

Strip Method.—Another method is known as the strip method, in which parallel strips are run the length of the woods, usually about one-fifth of the timber being covered. The strips are 66 feet, or a surveyor's chain, in width. Within the strips all the trees are measured and tallied. The average stand is then calculated on an acreage basis as in the sample plot method, and this standard is then applied to the entire acreage of woods.

Fig. 11. More than 60,000 feet of choice veneer tulip poplar logs were harvested from this area of Holmes County. Mills sawed native beech, sugar maple, and red oak into lumber for farm use.



Selling the Farm Woods Crop

As already pointed out, the greater percentage of Ohio's timber is growing in the farm woods. Farmers are the largest producers of sawlogs, lumber, ties, posts, and fuel wood. They are also the largest consumers of wood products. Consequently, logging and the manufacture of lumber is of great importance to our farm industry.

The same factors that determine the sale of other products on the farm control the sale of timber. Quality and volume are important factors in selling sawlogs and lumber. As a rule, when a piece of timber contains a large quantity of high grade lumber, it can be sold. If a farmer has several carloads of high quality logs, he has the advantage of the market over the farmer with a few logs, even though these may be of high quality.

Know How Much Timber is for Sale at Any Time.—Marketing of timber should progress in an orderly, well organized way, rather than selling in the dark or blindly. Too often the latter is the case, and the true value of the timber is never realized. The owner blames the buyer for taking an advantage in the deal, but in most cases there is no one to blame but the owner.

Methods Used in Selling Timber in Ohio.—The bulk of the timber in the farm woods is sold in the "lump." In this way a definite lump sum is offered for the entire tract. The advantage in using this method is that, if a reliable buyer is found, there is little chance for wrangling and disputes over the petty problems that enter into the sale of timber where other methods are used. When selling this way, the owner should have a definite idea as to the amount of timber he has for sale. A careful timber estimate, therefore, is important. The owner should also know the approximate value of his timber, so that he can deal intelligently with the buyer. If not, he probably will sell at a loss.

Another method is selling by log scale after the trees are felled in the woods. This is the ideal way in handling a selection woods, and probably fits into the farm woods plan of management better than any other method. The farmer may, by contract, use his own labor and team in cutting, skidding, and hauling the logs to the road or mill, thus receiving not only a price for his timber, but also sufficient extra to pay wages for his labor and team.

There are some disadvantages in sell-

Fig. 12. Ohio farms use about seven million posts each year. Many of these are and can be produced in farm woods. Locust posts shown below are on the way to market in Perry County.

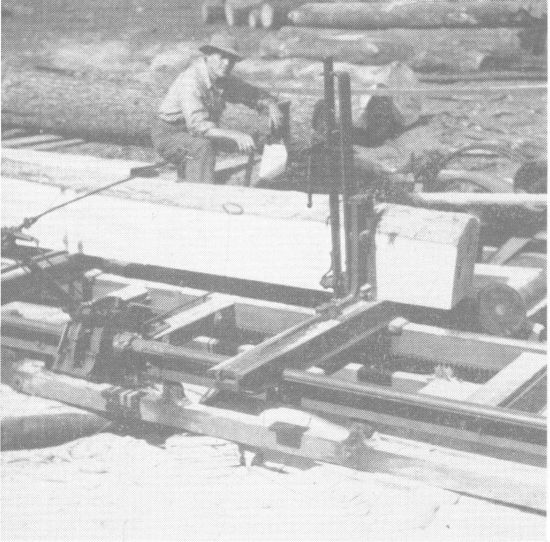


Fig. 13. Nearly 1600 sawmills operate in Ohio's woodlands. At least 90 percent of the marketable timber production comes from the farm woods.

Fig. 14. Choice tulip poplar, black walnut, sugar maple, and white oak logs are highly prized for veneers, radio cabinets, and furniture. Logs below are yellow poplar (tulip) on the way to market.

ing timber this way. Caution must be used in cutting logs in advance of buyers' demand or market. There are many examples where logs have been cut, scaled, but never taken out of the woods, due to unfavorable market conditions and a poorly written contract (or none at all). Selling by scale may also bring about disputes regarding the use of log rules and the price of the timber per thousand feet log scale. Without a binding contract, selling timber by log scale may not insure a close utilization of small logs, and there is a greater tendency for the buyer to take the "cream" of the logs, and leave the culled logs on the hands of the owner.

Cross ties, posts, poles, pulpwood, and mine props are usually sold by the piece or cord. A certain definite price is paid for each unit stick or piece of wood. This eliminates all dispute so far as log rule is concerned.

A Contract Is Desirable.—Regardless of the method used, all sales or deals should be protected with a good contract and backed by a reliable dealer. Good business principles apply to selling timber just as to any other product produced and sold from the farm.

All timber should be sold under a written contract drawn up by the owner specifying price, trees to be cut, location of sawmill, and all other items that enter into the agreement or sale of the timber between the owner and the buyer. (A sample contract is shown on page 16.)

Farm Operated Saw Mills.—Many farmers have entered into the complete operation of logging and sawing their timber into lumber or finished products. In most cases this has not been satisfactory in marketing the timber from the farm woods. The operation of a saw mill calls for trained and experienced men if merchantable timber is to be made and sold. As a rule, the average farm woods owner cannot afford to give the time and supervision that calls for the proper sawing of good lumber. Also, few farmers are acquainted with the trend of markets and proper sale of lumber to the wholesale dealer. The chief aim of a farm woods owner should be to grow good quality sawlogs, harvest and market them at a profitable margin, and let the saw mill operator saw the raw products into salable lumber.

Market Information Necessary.—Before selling timber, complete information should be obtained as to market conditions, prices, and reliable buyers in the region or comunity. Helpful information can be obtained from local sources such as persons who have recently sold their timber, or from local wood using industries and manufacturing plants. Competitive bids should be secured from several buyers to stimulate interest in the sale of the timber.

Additional information on marketing timber can be secured by addressing the Extension Forester, Agricultural Experiment Station, Wooster, Ohio; also by consulting your county agricultural agent.

Taxes on Ohio Farm Woods May Be Reduced One-Half

Under Ohio's forest tax law, a 50 per cent saving in taxes can be secured if the woodland areas are protected from grazing. This saving has encouraged a number of farm woods owners in the state to fence livestock out of the woods.

The law states that the tax rate shall be reduced one-half on the actual acreage in woods, and, that the value per acre, determined by the local taxing officials, must be based upon the true agricultural value of the land.

Application to take advantage of the forest tax law should be made to the Chief, Division of Forestry, Department of Natural Resources, Columbus, Ohio. An examination or inspection of the acreage by a forester is necessary before it can be accepted and classified. The saving alone in taxes per acre would not be great, but probably would equal or be more than the forage value of the woods if used for grazing purposes.

Summary of Management Recommendations

1. Make an inventory—Kinds, size, age, and volume; classify good producing trees like white oak, red oak, tulip poplar, white ash, and sugar maple.

2. Protect woods from grazing and fires.

3. Remove all vines that strangle or choke trees and valuable undergrowth. Apply chemical "brush killers."

4. Cut or girdle cull or wide-crowned trees that crowd or overtop valuable young growth. These include hollow or decayed beech, gum, pin oak, scarlet oak, jack oak, red maple, and scrubby growth elm.

5. Remove "weed trees," such as ironwood, water beech, dogwood, choke cherry, aspen, and sassafras where they interfere with seedling growth of oak, ash, tulip poplar, sugar maple and black walnut. Cut "weed trees" close to ground and let tops remain on forest floor to hold leaves in woods.

6. Leave a fringe of natural "windbreak" growth on west and southwest sides of forest area. Such a strip or border of natural growth should be 25 to 30 feet to protect interior woods from storm damage and hold natural leaf mulch within wood area.

7. Avoid making large openings in the woods except where there is a market available for low grade logs. Use selection method in cutting trees for high quality saw logs. Leave seed trees of good varieties to reproduce.

8. Plant good varieties in large openings in woods that are reseeding slowly. Use native hardwoods—walnut, oak, tulip poplar or ash. Do not plant pine beneath or near crowns of other hardwood trees. If evergreens are to be used in under planting hardwoods, use hemlock or spruce.

Doyle Log Rule

Diameter of log (inches)	Volume of Log in Board Feet for Lengths									Diameter of log (inches)
	8 feet	9 feet	10 feet	11 feet	12 feet	13 feet	14 feet	15 feet	16 feet	
6	2	2	2	3	3	3	3	4	4	6
7	4	5	5	6	7	7	8	8	9	7
8	8	9	10	11	12	13	14	15	16	8
9	12	14	16	17	19	20	22	23	25	9
10	18	20	22	25	27	29	31	34	36	10
11	24	28	31	34	37	40	43	46	49	11
12	32	36	40	44	48	52	56	60	64	12
13	40	46	51	56	61	66	71	76	81	13
14	50	56	62	69	75	81	87	94	100	14
15	60	68	76	83	91	98	106	113	121	15
16	72	81	90	99	108	117	126	135	144	16
17	84	95	106	116	127	137	148	158	169	17
18	98	110	122	135	147	159	171	184	196	18
19	112	127	141	155	169	183	197	211	225	19
20	128	144	160	176	192	208	224	240	256	20
21	144	163	181	199	217	235	253	271	289	21
22	162	182	202	223	243	263	283	304	324	22
23	180	203	226	248	271	293	316	338	361	23
24	200	225	250	275	300	325	350	375	400	24
25	220	248	276	303	331	358	386	413	441	25
26	242	272	302	333	363	393	423	454	484	26
27	264	298	331	364	397	430	463	496	529	27
28	288	324	360	396	432	468	504	540	576	28
29	312	352	391	430	469	508	547	586	625	29
30	338	380	422	465	507	549	591	634	676	30
31	364	410	456	501	547	592	638	683	729	31
32	392	441	490	539	588	636	686	735	784	32
33	420	473	526	578	631	683	736	788	841	33
34	450	506	562	619	675	731	787	844	900	34
35	480	541	601	661	721	781	841	901	961	35
36	512	576	640	704	768	832	896	960	1024	36
37	544	613	681	749	817	885	953	1021	1089	37
38	578	650	722	795	867	939	1011	1084	1156	38
39	612	689	766	842	919	995	1072	1148	1225	39
40	648	729	810	891	972	1053	1134	1215	1296	40

From: Mattoon, Wilbur R. and Barrows, William B.—"Measuring and Marketing Farm Timber." United States Department of Agriculture—Farmers' Bulletin 1210. (Revised April, 1930.) Table 8, pp. 18-19.

International Log Rule (¼" Kerf)

Diameter of log (inches)	Volume of Log in Board Feet for Lengths									Diameter of log (inches)
	8 feet	9 feet	10 feet	11 feet	12 feet	13 feet	14 feet	15 feet	16 feet	
6	10	10	10	10	15	15	15	20	20	6
7	10	15	15	15	20	20	25	25	30	7
8	15	20	20	25	25	30	35	35	40	8
9	20	25	30	30	35	40	45	45	50	9
10	30	35	35	40	45	50	55	60	65	10
11	35	40	45	50	55	65	70	75	80	11
12	45	50	55	65	70	75	85	90	95	12
13	55	60	70	75	85	90	100	105	115	13
14	65	70	80	90	100	105	115	125	135	14
15	75	85	95	105	115	125	135	145	160	15
16	85	95	110	120	130	145	155	170	180	16
17	95	110	125	135	150	165	180	190	205	17
18	110	125	140	155	170	185	200	215	230	18
19	125	140	155	175	190	205	225	245	260	19
20	135	155	175	195	210	230	250	270	290	20
21	155	175	195	215	235	255	280	300	320	21
22	170	190	215	235	260	285	305	330	355	22
23	185	210	235	260	285	310	335	360	290	23
24	205	230	255	285	310	340	370	395	425	24
25	220	250	280	310	340	370	400	430	460	25
26	240	275	305	335	370	400	435	470	500	26
27	260	295	330	365	400	435	470	505	540	27
28	280	320	355	395	430	470	510	545	585	28
29	305	345	385	425	465	505	545	590	630	29
30	325	370	410	455	495	540	585	630	675	30
31	350	395	440	485	530	580	625	675	720	31
32	375	420	470	520	570	620	670	720	770	32
33	400	450	500	555	605	660	715	765	820	33
34	425	480	535	590	645	700	760	815	875	34
35	450	510	565	625	685	745	805	865	925	35
36	475	540	600	665	725	790	855	920	980	36
37	505	570	635	700	770	835	905	970	1040	37
38	535	605	670	740	810	885	955	1025	1095	38
39	565	635	710	785	855	930	1005	1080	1155	39
40	595	670	750	825	900	980	1060	1140	1220	40

From: Chapman, H. H.—"Forest Mensuration." J. Wiley & Sons, N. Y. 1924. Table LXXX, p. 494.

Sample Timber Sale Contract

Agreement entered into this 10th day of December, 195..., between John Doe, of Pickering, Ohio, hereinafter called the seller, and William Roe of Junction, Ohio, hereinafter called the purchaser.

Witnesseth:

Article I. The seller agrees to sell to the purchaser, upon the terms and conditions hereinafter stated, all the living timber marked or designated by the seller and all merchantable and dead timber, standing or down, estimated to be 35,000 board feet, more or less, on a certain tract of land situated in the township of Smith, County of Marshall, State of Ohio, and located on the farm belonging to the seller, and about one-half mile west of his farmhouse.

Article II. The purchaser agrees to pay the seller the sum of three hundred dollars ($300), more or less, as may be determined by the actual scale, at the rate of.....dollars ($.....) per thousand board feet for white oak and hard maple, ...dollars ($.....) for red oak, hickory, red maple, and beech,.....dollars ($.....) for yellow poplar, and..... dollars ($.....) for black walnut, payable prior to the date of removal of material in installments of one hundred dollars ($100) each.

Article III. The purchaser further agrees to cut and remove said timber in strict accordance with the following conditions:

1. Unless extension of time is granted, all timber shall be cut, paid for, and removed on or before April 15, 195 .
2. Saw timber shall be scaled by the ..... log, rule, and measured at the small end along the average diameter inside the bark to the nearest inch. The sapwood of black walnut shall not be scaled out as a defect.
3. The maximum scaling length of logs shall be 16 feet; greater lengths shall be scaled as two or more logs. Upon all logs an additional length of 4 inches shall be allowed for trimming. Logs overrunning this allowance shall be scaled not to exceed the next foot in length.
4. No unmarked timber of any kind shall be cut. All marked trees shall be cut by purchaser. No timber under 12 inches in diameter at breast height will be marked by the seller.
5. A log, 9 feet long or more to an 8-inch top (1 tie), and any other log which is 33 percent or more sound will be considered merchantable.
6. Stumps shall be cut so as to cause the least possible waste; stumps of trees up to 16 inches in diameter not higher than 12 inches above the ground and those of trees above this size at a distance above the ground not greater than three-fourths of their diameter.
7. All trees shall be utilized in their tops to the lowest diameter for commercially salable material.
8. Young trees shall be protected against unnecessary injury; only dead trees and the less valuable kinds may be used for construction purposes in connection with lumbering.

Article IV. It is mutually understood and agreed by and between the parties hereto as follows:

1. All timber included in this agreement shall remain the property of the seller and shall not be removed until paid for in full.
2. In case of dispute over the terms of this contract, final decision shall rest with a reputable person to be mutually agreed upon by the parties to this contract; and in case of further disagreement, with an arbitration board of three persons, one to be selected by each party of this contract and a third to be the State Forester or his chosen representative.

In witness whereof the parties hereto have hereunto set their hands and seals this ..... day of ..... 195.....

Witnesses:

.....

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7/51—11M

The Ohio State University and the U. S. Department of Agriculture Cooperating
Agricultural Extension Service, C. M. Ferguson, Director, Columbus, Ohio
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